STS-102/ET-107 Flight Readiness Review

External Tank Project

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Overview

- **Limited Life Component Status**
  - All items within required life
- **Processing Anomalies - None**
- **Design Change**
  - Resize foam thickness on LO2 tank ogive
- **Waiver Status**
  - LO2 tank TPS does not meet the launch probability “no-ice” requirement
    - Presented with *Design Change*
  - LH2 feedline contamination
- **Open work/paper - No constraints**

Design Change
Resize Foam Thickness on LO2 Tank Ogive

- **Change**
  - Resized foam thickness on LO2 tank ogive
    - Decreased minimum net sprayed foam thickness on the +Z LO2 tank

LO2 Tank	*STS-98/ET-106*	*STS-102/ET-107*
Station 404	2.15 ± 0.25	1.85 ± 0.25
to	↓	↓
Station 540	2.15 ± 0.25	1.00 ± 0.15
Station 570 - 848	1.00 ± 0.15	0.88 ± 0.13

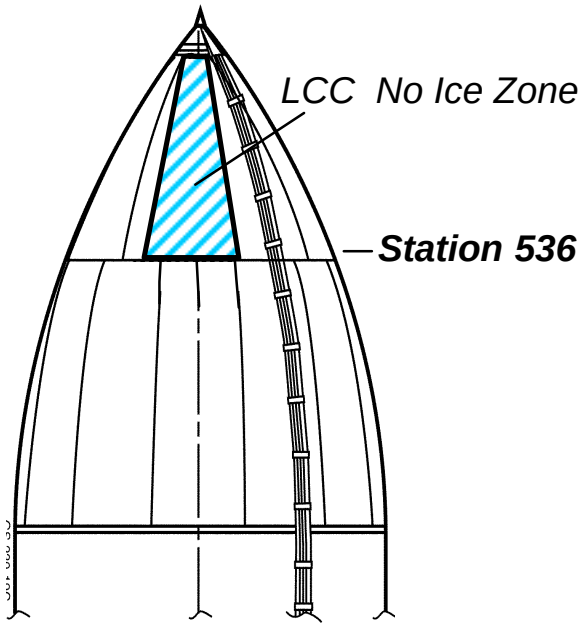
- **Background**
  - Producibility
    - Eliminate TPS rework (sanding) effort associated with potential negative contour deviations on the +Z LO2 tank adjacent to the Station 536 O2 weld
      - Contour deviations could, if not addressed, cause TPS cracking during tanking resulting in scrub or TPS debris

Reworked (sanded) area at Station 536

(STS-95/ET-98 shown)

Design Change
Resize Foam Thickness on LO2 Tank Ogive

- **Waiver as result of foam thickness reduction**
  - Subsequent thermal analysis showed that thickness reduction resulted in an inability to meet the launch probability requirement of NSTS 07700, Vol. X, para 3.2.1.2.14
    - Launch holds due to ice formation shall not occur more than 5% of the time on annual basis
  - Reduced foam thickness results in a minor decrease in launch probability (93.3% vs 95% required)
  - Waiver to NSTS 07700, Vol. X, para 3.2.1.2.14 approved for ET-102 & ETs 107-110 (PRCBD S071290, 03/10/00)
    - Previously presented for STS-101/ET-102



LO2 Tank
(+Z Shown)

Design Change
Resize Foam Thickness on LO2 Tank Ogive

- **Basis for Certification**
  - Analysis
    - Structural:
      - No change to ascent temperatures/FS unchanged
      - Reentry requirements maintained
    - Propulsion: LO2 mass requirement maintained
      - Negligible impact due to heat gain
    - Aero: No impact to surface waviness
  - Inspection - Final Inspection Team routinely monitors the External Tank for ice formation that would violate a Launch Commit Criteria (LCC)
    - If ice formation were predicted prelaunch, the final inspection team walkdown would initiate an assessment using the tools defined in the LCC to determine if ice is present

Waiver Status

- **LO2 tank TPS does not meet the launch probability "no-ice" requirement**
  - Waiver to NSTS 07700, Vol. X approved on 03/10/00, PRCBD S071290
    - *Previously discussed with Design Change*
- **LH2 feedline contamination**
  - During a routine borescope inspection of the ET-107 LH2 tank feedline system, two pieces of material were observed that exceeded the 400 micron level requirement in SE-S-0073, Specification Fluid Procurement and Use Control and ICD 2-12001 (Orbiter Vehicle)
    - 0.375" long x 0.003" diameter raised metallic burr on the cruciform
    - 0.212" long x 0.053" wide cloth fiber
    - Both particles were discovered downstream of the LH2 tank siphon screens
  - After coordination with the MPS and the SSME community, it was determined that this contamination issue poses no safety-of-flight concern
    - No compatibility issue with either object
    - MPS can tolerate the ingestion of these particles with no deleterious effect on performance
  - Waiver to SE-S-0073 and ICD 2-12001 approved on 01/23/01, PRCBD S058410H

The External Tank, ET-107, is certified and ready for STS-102 flight pending completion/closure of open and planned work